DOCUMENT RESUME

ED 101 828 PS 007 523

AUTHOR Weaver, Christopher T.; Fry, Charles L.
TITLE Intonation and Fundamental Frequency of Infants' and Parents' Vocalizations During Social Interaction.
PUB DATE [74]
NOTE 9p.

EDRS PRICE MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS Identification (Psychological); *Imitation; *Infant Behavior; Interaction Process Analysis; *Intonation; Language Development; Oral Expression; *Parent Child Relationship; Social Behavior; Stimulus Behavior; *Verbal Development

ABSTRACT

Infants raised the pitch of their vocalizations when stimulated by vocalizing parents. Nonvocal stimulation did not repeat the effect. Intonation contours did not change during different conditions. The pitch of the parents' vocalizations also rose during vocal interaction. Changes in infant pitch were interpreted as a function of imitation. (Author/CS)

SEP. 3 1974

ED101828

(1) Title: Intonation and fundamental frequency of infants' and parents' vocalizations during social interaction.

(2) Authors: Christopher T. Weaver and Charles L. Fry
University of Virginia

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

(4) Abstract: Infants raised the pitch of their vocalizations when stimulated by vocalizing parents. Non-vocal stimulation did not repeat the effect. Intonation contours did not change during different conditions. The pitch of the parents' vocalizations also rose during vocal interaction. Changes in infant pitch were interpreted as a function of imitation.

(7) Mailing address: Christopher T. Weaver
Department of Psychology
102 Gilmer Hall
University of Virginia
Charlottesville, Va. 22901

PS007523

(1) Title: Intonation and fundamental frequency of infants' and parents' vocalizations during social interaction.

(2) Major purpose: The present investigation focused on the use of fundamental frequency by infants and parents during parent-infant interaction. Also investigated was the question of whether intonation contours (i.e., rising-falling of fundamental frequency) of infant vocalizations would change during different types of parent-infant interaction.

Lieberman (1967) found that two infants, 10 and 13-months old, lowered the fundamental frequency of their vocalizations during social interaction toward the fundamental frequency of the parents. This was thought to be a form of mimicry. Banikiotes, Banikiotes, and Montgomery (1972) using tape recorded voices as stimuli did not find this effect with three-month-old infants. They concluded that imitation of fundamental frequency must start between three and 10 months of age.

Webster, Steinhardt, and Senter (1972), using seven-month-old infants, found that infants raised the fundamental frequency of their vocalizations to tape recorded, high pitched, vowel sounds, and although not significant, tended to lower their fundamental frequency to lower pitched vowel sounds. They concluded that this was evidence for infants changing their fundamental frequency in the direction of the vocal stimulation.

The present investigation provides additional evidence on how infants and parents use fundamental frequency during interaction in the home. By using a field experiment it was hoped that previous findings could be supported and clarified by a more naturalistic situation.

(3) Subjects: The subjects were 32 healthy infants. The data for nine infants were discarded because of crying during the recording session. The mean age for the remaining 23 infants (12 males, 11 females) was 6 months 15 days. Ss were obtained by telephone solicitation or newspaper advertisements. Parents of the infants were mainly from the university community with both parents usually having some college education.

(4) Procedure: After visiting the home of the infant, setting up the microphone, and answering questions on how the experiment was to be run, E usually returned for the recording session on the following day. The written instructions given to the parents emphasized that the recording session should be held when the infant was in a highly active and satisfied state, and during the normal routine of the day. Each infant was recorded only once during a session that lasted approximately 30 minutes.

Conditions under which the infants and parents were recorded were: Infant alone. While alone in a room the vocalizations of the infant were recorded. Infants were usually occupied with one of their toys. The hypothesis was that the infant-alone condition would exemplify the typical

fundamental frequency of the infant's vocalizations. Thus other conditions in which the infant vocalized could be compared to this baseline condition to see if any changes had occurred in fundamental frequency.

Mother-non-vocal. Mother entered the room and non-vocally interacted with the infant. Mother was instructed not to tickle or vocalize to the infant. This interaction lasted approximately 30 seconds until E signalled mother to leave the room.

Mother-vocal. At the signal of E, the mother immediately approached the infant again. The mother then vocalized intermittently to the infant the syllables "ba, ba" in her normal way of speaking to the infant. This interaction lasted approximately 30 seconds and then the mother was signaled to leave the room. Vocalizations analyzed in this condition were those of the mother and infant.

The father followed the same procedure as the mother. To compare the vocalizations of the fathers and mothers when interacting with their infants to vocalizations used during normal speech, the mother and father were asked to repeat the syllables "ba, ba" as if they were saying a statement (Mother - statement, Father - statement).

(5) Results: Vocalizations recorded on a Sony Stereo Recorder (Model TF-530) were analyzed on a Kay Electric Company Sonagraph (Model 6061-A). Vocalizations were analyzed for 23 infants and 37 parents. Technical problems resulted in seven

parents' data being eliminated.

The infant-alone condition was used as a baseline. For each condition and each infant, the means of the conditions were compared to the baseline to see whether the fundamental frequency of the vocalizations rose (+) or fell (-) during different social interactions. Thus each infant served as his own control.

Table 1 shows that a significant number of infants as analyzed by sign tests raised the fundamental frequency of their vocalizations when interacting with vocalizing mothers and fathers. This effect was not found for non-vocal conditions. Sign tests shown in Table 2 reveal that a significant number of mothers and fathers raised the fundamental frequency of their vocalizations when interacting with their infants.

Vocalizations of the infants were analyzed for intonation contours by marking the fundamental frequency bar on the voiceprint at the beginning, middle, and end point of each vocalization. For the infant-alone condition, the typical intonation contour was one of a rising-falling contour. These contours did not appreciatively change during social interaction with the parents.

(6) Implications and conclusions: The results showed that the fundamental frequency of infant vocalizations can be modified by social interaction in which vocalizing by the parents occurs. During this interaction a rise in the fundamental

frequency of both the parents' and infants' vocalizations occurred. If the infants are imitating the parents, then they would seem to be imitating the direction of change of pitch of the parent's vocalizations. The fundamental frequency of the parents' vocalizations did not attain the high frequency of infant vocalizations (approximately 360-420$H_z$) and could not be compared to the high pitched stimuli (500-600 $H_z$) used by Webster et al (1972).

These findings could explain why Webster et al (1972) found only a trend for infants to lower their fundamental frequency to low pitched stimuli. Since parents raise the fundamental frequency of their vocalizations when interacting with their infants, the infants may be more prone to raise their fundamental frequency in response. The imitation of the change of direction of fundamental frequency seems to be a preliminary step in language acquisition and may be a forerunner of the imitation of absolute fundamental frequency as found by Lieberman (1967).

Finally, analysis of intonation contours confirmed evidence stated by Weir (1967) on the use of intonation contours in infancy. Results revealed that intonation contours did not change during different social interacting conditions.

Thus, the use of different intonation contours for types of statements and paralinguistic cues must develop at a later stage.

## References

Banikiotes, F. G., Banikiotes, P. S. & Montgomery, A. A. Male and female auditory reinforcement of infant vocalizations. Developmental Psychology, 1972, 6, 476-481.

Lieberman, P. Intonation, perception, and language. Cambridge, Mass.: MIT Press, 1967.

Webster, R. L., Steinhardt, M. H., & Senter, M. G. Changes in infants' vocalications as a function of differential acoustic stimulation. Developmental Psychology, 1972, 7, 39-45.

Weir, R. Language in the crib. The Hague: Morton and Co., 1962.

00008

TABLE 1

Z Scores and Total Number of +'s, -'s, and 0's for Experimental Conditions

| Conditions | Total + | Total - | Total 0 | Z Score | N |
|---|---|---|---|---|---|
| Mother-non-vocal | 12 | 8 | 0 | 0.67 | 20 |
| Mother-vocal | 15 | 4 | - | 2.30* | 19 |
| Father-non-vocal | 6 | 8 | 1 | 0.00 | 14 |
| Father-vocal | 13 | 5 | 0 | 1.65 | 18 |
| Mother-non-vocal Father-non-vocal Combined | 18 | 16 | 1 | 0.34 | 34 |
| Mother-vocal Father-vocal Combined | 28 | 9 | 0 | 3.07* | 37 |

*$p < .05$ (two-tailed)

TABLE 2

Summary of Means and Z Scores for Related Data for Parental Vocalizations

| Conditions | Means ($H_z$) | Total Vocalizations | Totals + | Totals - | Totals 0 | Z Scores | N |
|---|---|---|---|---|---|---|---|
| Mother-statement versus Mother-vocal | 185.13<br>246.29 | 111<br>186 | 17 | 2 | 0 | 3.22* | 19 |
| Father-statement versus Father-vocal | 118.92<br>157.78 | 98<br>151 | 17 | 1 | 0 | 3.55* | 18 |

*$p < .01$ (two-tailed)

00009